# Touch Key Workshop v3.0
# User's Guide

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# 1 Development Platform Introduction and S/W Installation

The HOLTEK Touch Key Workshop V3 is a third generation platform, using an intuitive drag and drop methodology for touch switch project implementation. It fully integrates the touch software library, compiler function, key signal monitor and parameter adjustments functions.

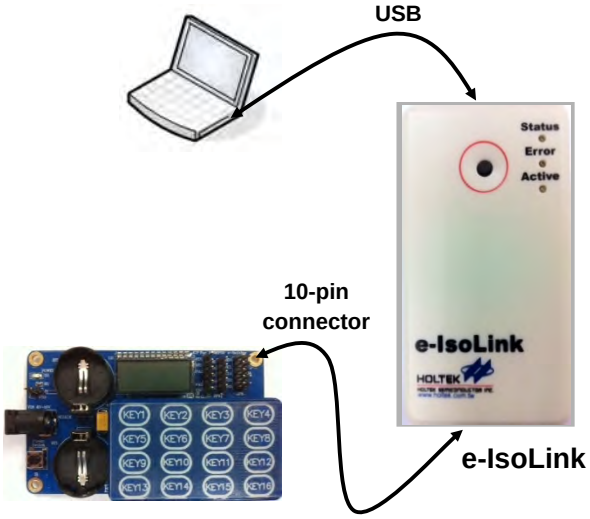
## Characteristics

- Supports BS82xxx, BS83xxx, BS84xxx Flash series MCUs
- Provides friendly and intuitive operation interface
- Easy key sensitivity and parameter adjustment
- Integrated compiler
- Integrated touch control and peripheral library
- Advanced users defined component libraries

## System requirements

- PC with USB interface
- Operation system: Microsoft Windows® XP or above

## System Configuration

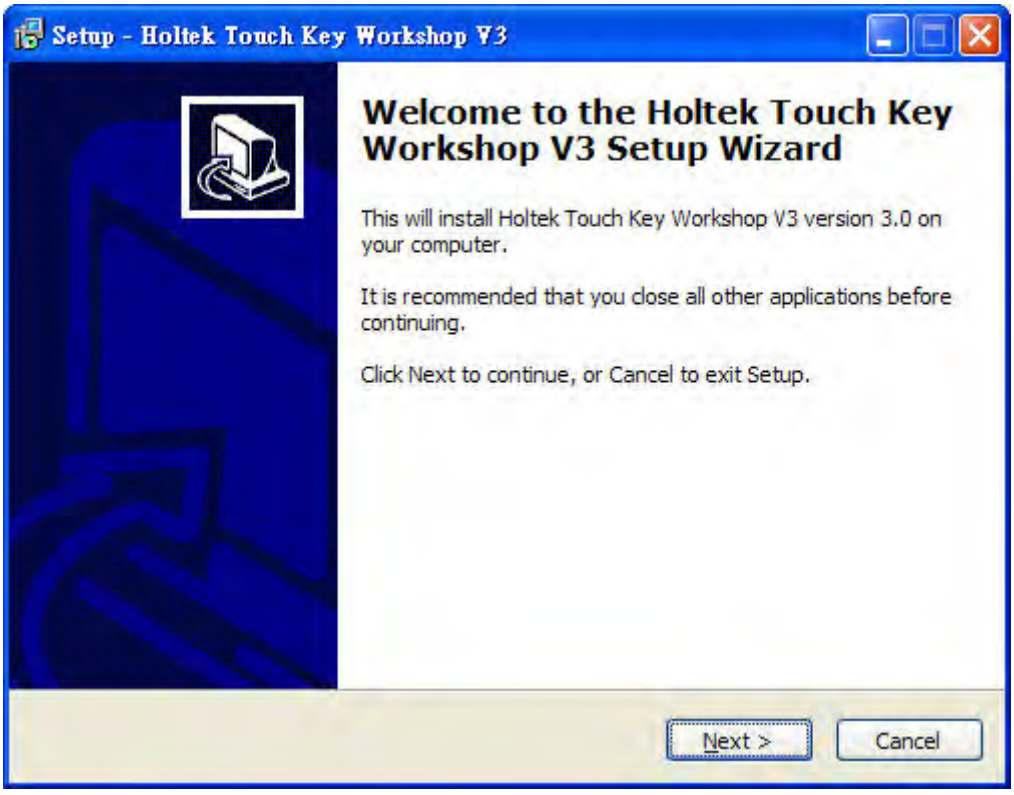


- S/W Components
  - Holtek Touch Key Workshop: Used for MCU key setup, touch parameter setup, program generator and compiler functions
  - Holtek Touch Key Tuning: key signal monitor, sensitivity adjustment and touch parameter adjustment
- H/W Components
  - e-IsoLink: Used for OCDS, In Circuit Programming (ICP) and data uploading
  - Target board: Used for functional verification

## S/W Installation

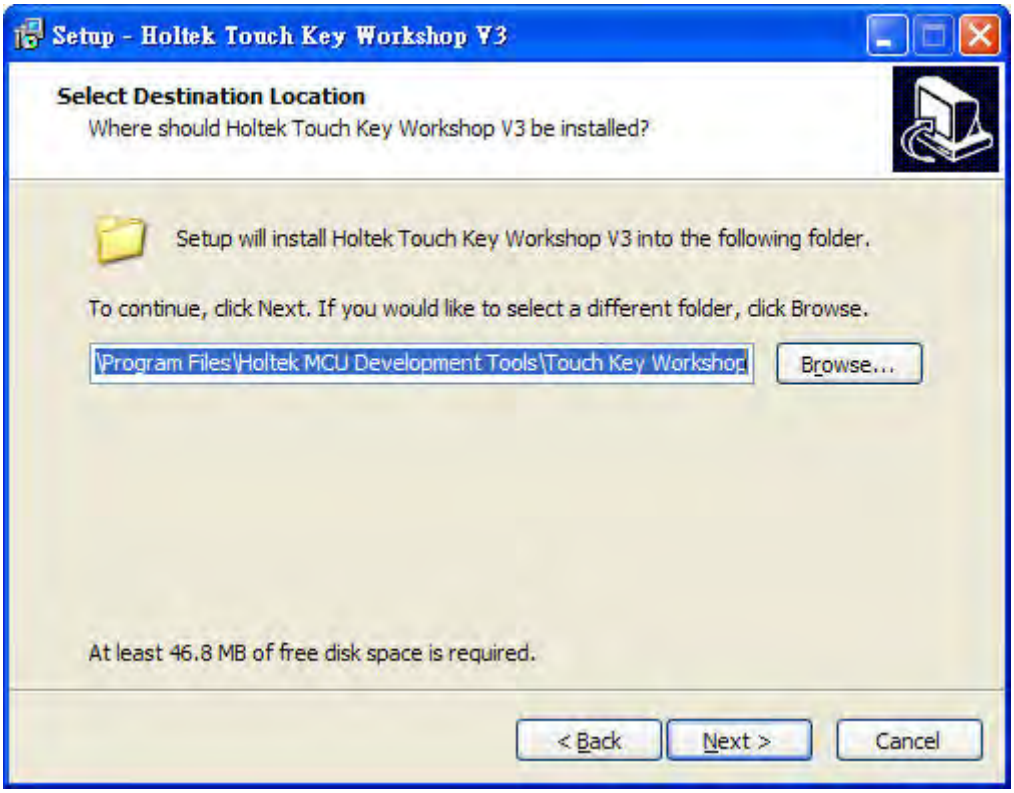
- **Step 1**

  When starting the software installation, the following welcome dialogue will be displayed after which 'Next' should be selected to proceed with the installation.


Setup - Holtek Touch Key Workshop V3
Welcome to the Holtek Touch Key Workshop V3 Setup Wizard
This will install Holtek Touch Key Workshop V3 version 3.0 on your computer.
It is recommended that you close all other applications before continuing.
Click Next to continue, or Cancel to exit Setup.
Next >
Cancel

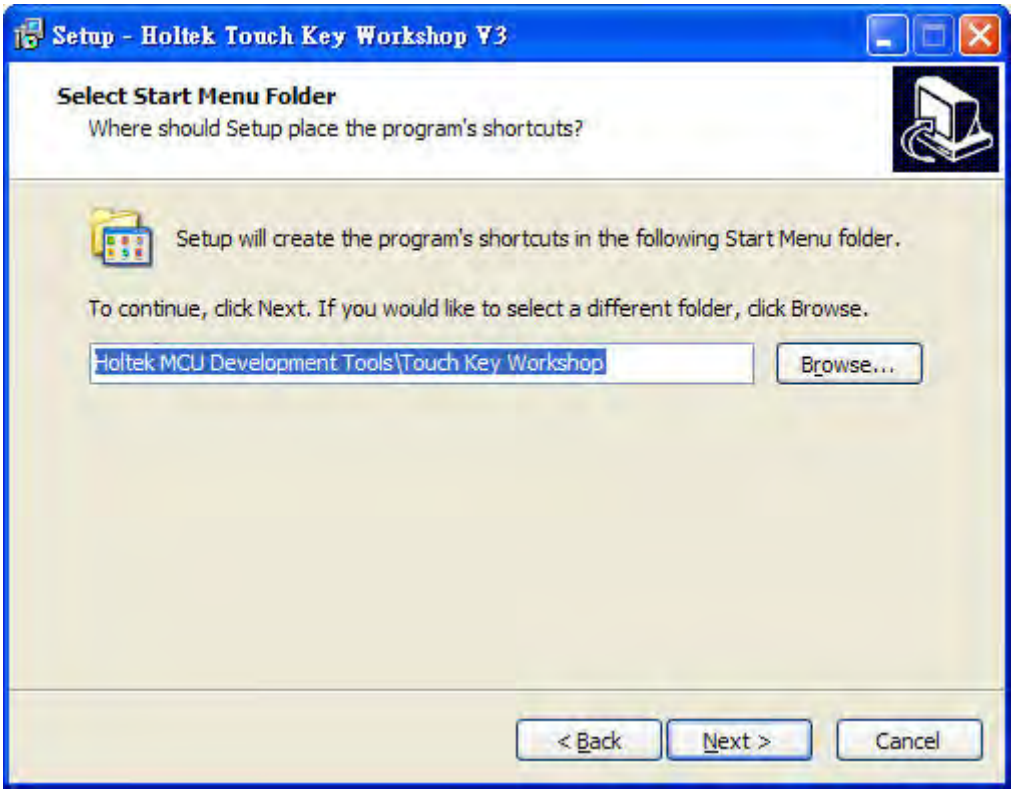
- **Step 2**

  Setup the installation folder, the default folder is "C:\Program Files\Holtek MCU Development Tools\Touch Key Workshop", and click "Next" to continue the installation.


Setup - Holtek Touch Key Workshop V3
Select Destination Location
Where should Holtek Touch Key Workshop V3 be installed?
Setup will install Holtek Touch Key Workshop V3 into the following folder.
To continue, click Next. If you would like to select a different folder, click Browse.
\Program Files\Holtek MCU Development Tools\Touch Key Workshop
Browse...
At least 46.8 MB of free disk space is required.
< Back
Next >
Cancel

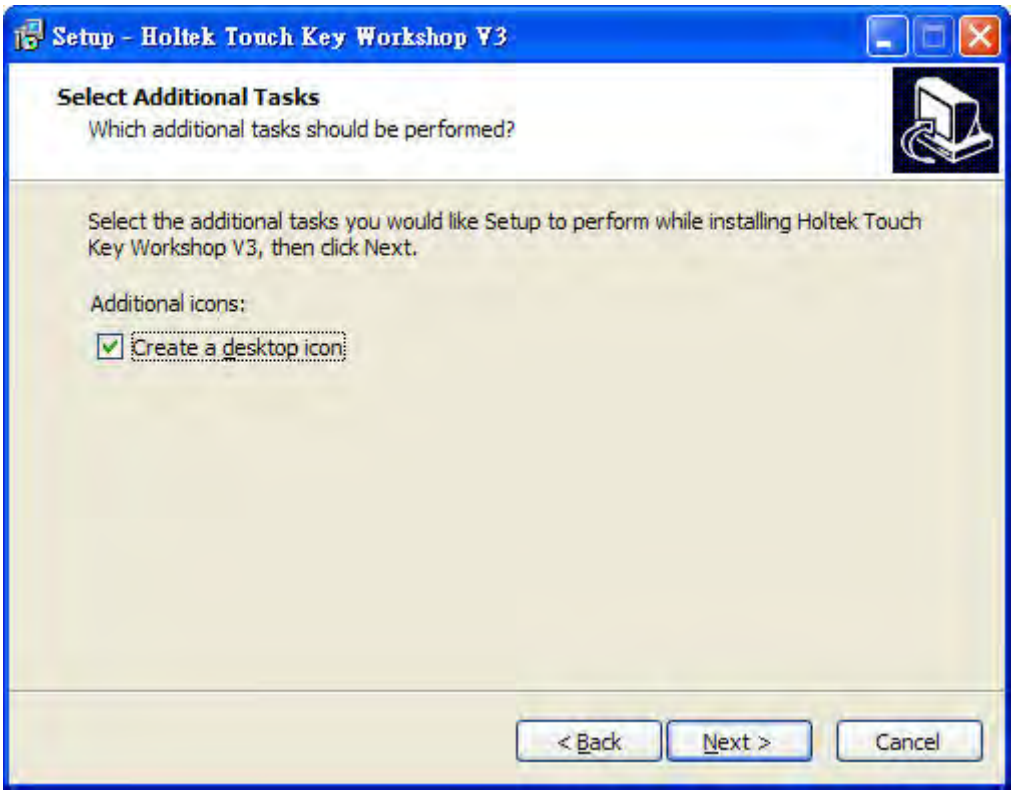
- **Step 3**

  Setup the start menu folder, the default folder is "Holtek MCU Development Tools\Holtek Touch Key Workshop", and click "Next" to continue the installation.


Setup - Holtek Touch Key Workshop V3
Select Start Menu Folder
Where should Setup place the program's shortcuts?
Setup will create the program's shortcuts in the following Start Menu folder.
To continue, click Next. If you would like to select a different folder, click Browse.
Holtek MCU Development Tools\Touch Key Workshop
Browse...
< Back
Next >
Cancel

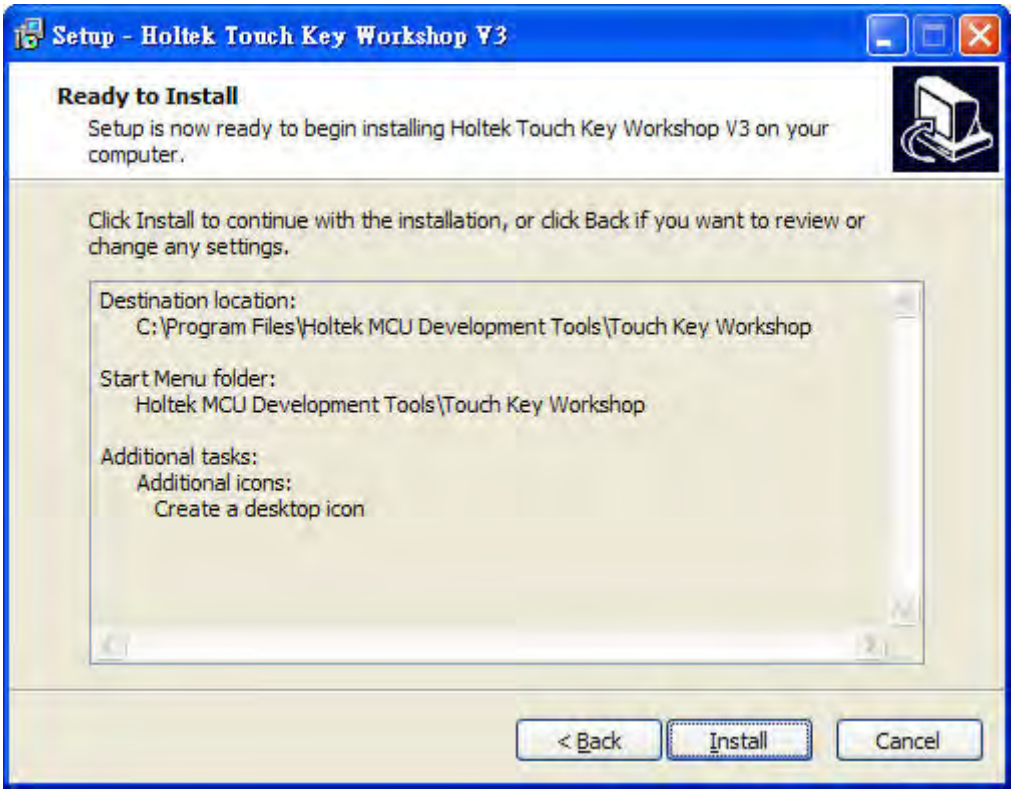
- **Step 4**

  To add a desktop shortcut, check "Create a desktop icon".


Setup - Holtek Touch Key Workshop V3
Select Additional Tasks
Which additional tasks should be performed?
Select the additional tasks you would like Setup to perform while installing Holtek Touch Key Workshop V3, then click Next.
Additional icons:
Create a desktop icon
< Back
Next >
Cancel

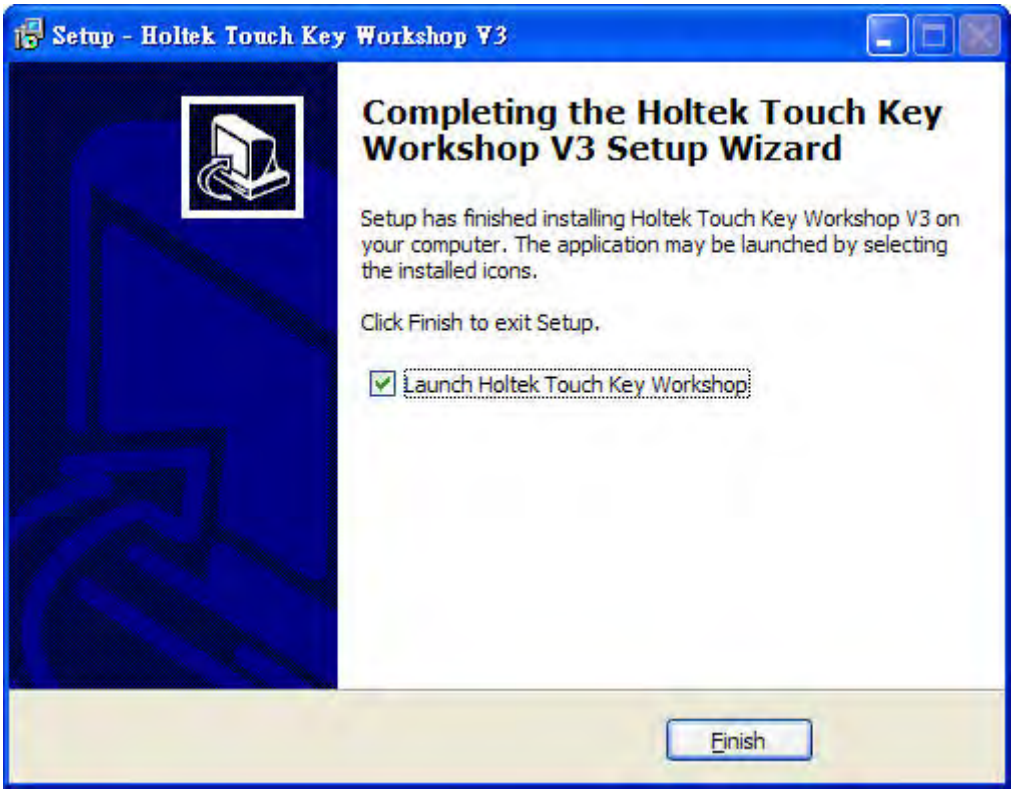
- **Step 5**

  Confirm the settings, click "Back" to return to the the previous steps to modify if necessary, or click "Install" to complete the installation.


Setup - Holtek Touch Key Workshop V3
Ready to Install
Setup is now ready to begin installing Holtek Touch Key Workshop V3 on your computer.
Click Install to continue with the installation, or click Back if you want to review or change any settings.
Destination location:
C:\Program Files\Holtek MCU Development Tools\Touch Key Workshop
Start Menu folder:
Holtek MCU Development Tools\Touch Key Workshop
Additional tasks:
Additional icons:
Create a desktop icon
< Back
Install
Cancel

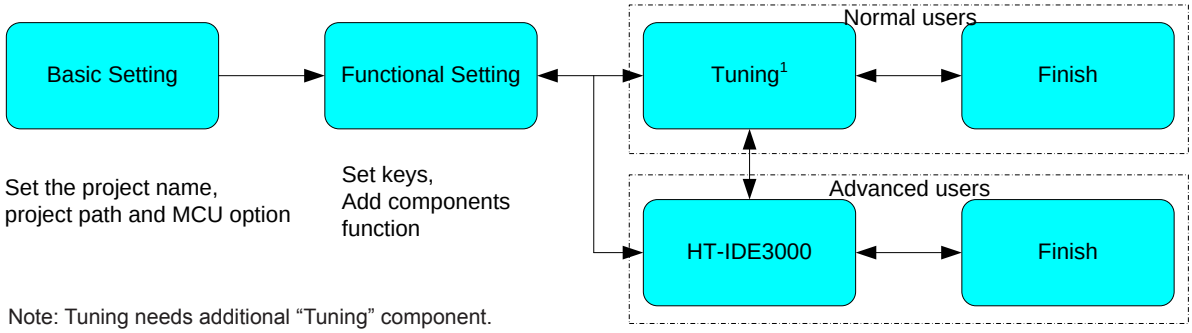
- **Step 6**

  The completion dialogue will be shown after the installation is completed. If the "Launch Holtek Touch Key Workshop" box is checked, the S/W will be executed after the 'Finish' button is clicked.


Setup - Holtek Touch Key Workshop V3
Completing the Holtek Touch Key Workshop V3 Setup Wizard
Setup has finished installing Holtek Touch Key Workshop V3 on your computer. The application may be launched by selecting the installed icons.
Click Finish to exit Setup.
Launch Holtek Touch Key Workshop
Finish

# 2 Touch Key Workshop S/W Functions and Operation

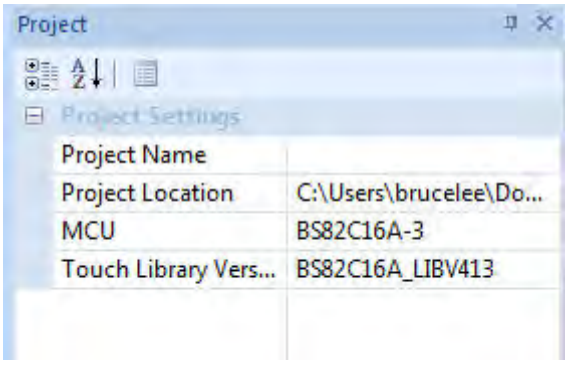
## S/W Development Flow




## Quick Start

### Create a new project

1. In the "Project Name" location in the project window, enter a project name.
2. In the "Project Location" set the project path, the default path is the same as that of the HT-IDE3000. After the project has been created, it will generate a new subdirectory with the same project name in the directory to store any related files.
3. Choose the MCU that is to be used in the project.
4. Choose the touch library version.



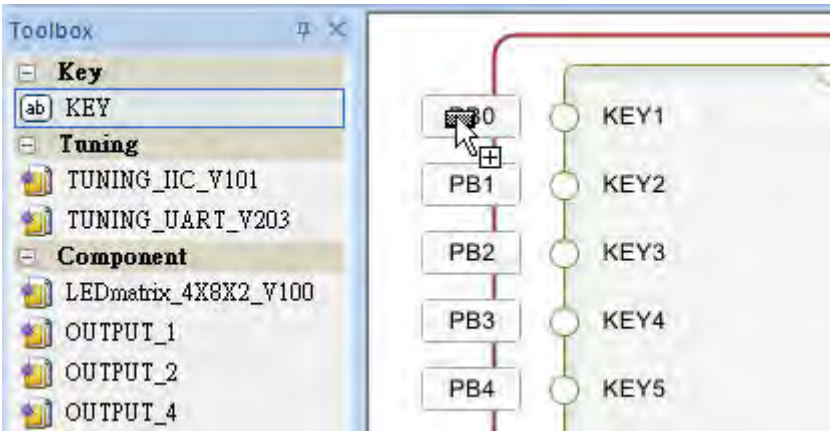

Note: If there is an old project in start interface, you can click "New" to create a new project, and then operate according to the above steps 1 to 4.

## Add keys and components

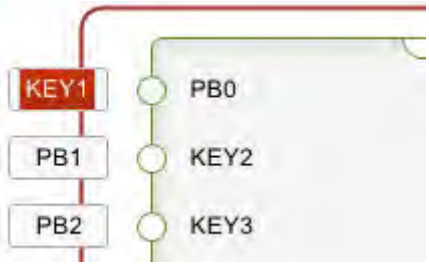
### 1. Add a key

**Method 1**

Drag a "KEY" from the toolbox to the IC pin position labeled KEY, as shown below:

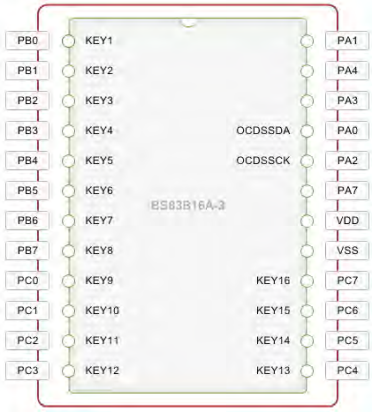



Release the left mouse button and it will change to the condition shown below where the original PB0 name changes to the key function.



**Method 2**

Drag a "KEY" from the toolbox into the IC block shown by the dotted box. The touch keys will be automatically arranged in a KEY1, KEY2 ...etc order.

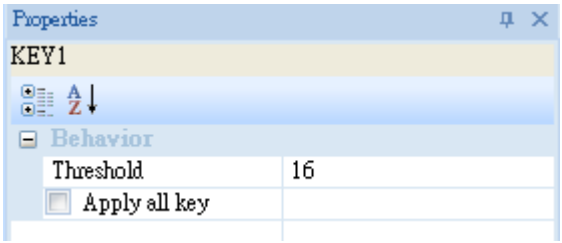



### 2. Add a component

Drag a component from the toolbox into the IC block, shown by the blue box in the diagram to complete the settings.

## Key or component property setting

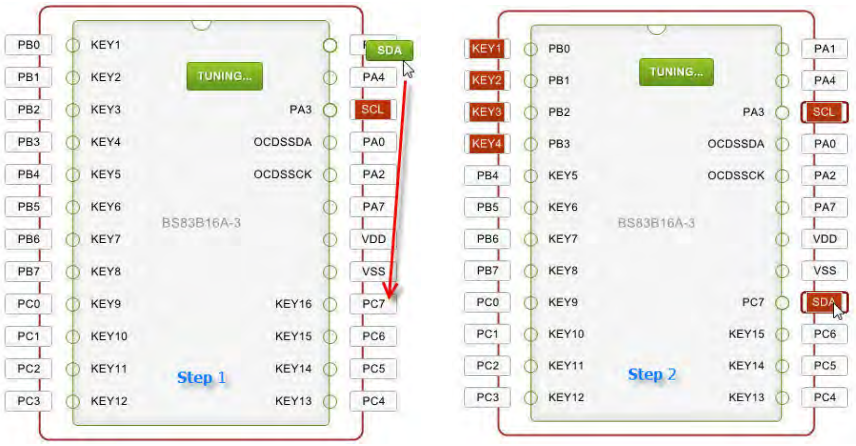
When dragging a key or a component from the toolbox, its property settings will be displayed in the properties window. The following figure shows the key threshold value setting. If the properties window is blank, this means that the key has not had any properties setup.



### Change the key or component pin setup

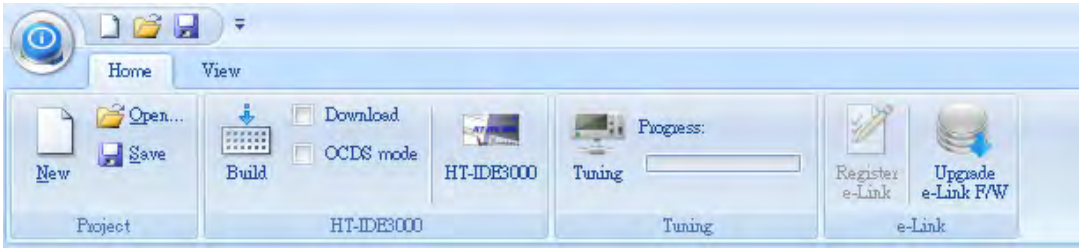
The already setup pins, shown in red, can be directly dragged to other I/O pins which have a KEYx label. When dragged the pin colour will change to green. If the colour turns red, then the pin setup is complete. If the colour of the dragged pin does not change to red, then this means that the pin could not be changed.

For example, to change the SDA pin in the Scope component to PC7, just drag the SDA directly to PC7 pin until the colour turns red.




## S/W Functional Description

### Menu Functional Description



### Home Menu Functions

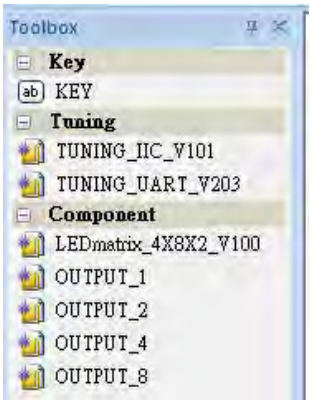
- New: Create a new project
- Open: Open an already saved project file
- Save: Save the current edited project
- Build: Build project
  - Download: If checked, the program will be downloaded to the board after successful compilation. The board must not be connected to an external power supply or batteries when downloading.
  - OCDS mode: If checked, components must not be setup on the pins labeled OCDSSDA and OCDSSCK.
- HT-IDE3000: Advanced users can use the HT-IDE3000 to continue to develop the project. After executing the HT-IDE3000, the Touch Key Workshop will be switched off automatically. If the user's computer is not installed with the HT-IDE3000, then it will be in a gray state.
- Tuning: This is used to fine tune the Touch Keys to obtain the optimal sensitivity and touch parameter adjustments. If TUNING components are not chosen, such as TUNING_IIC and TUNING_UART, this column will be in a gray state.
- Register e-Link: Note that the e-Link must be registered before use. If registered, it will be in a gray state.
- Upgrade the e-Link F / W: This will upgrade the e-IsoLink firmware, or change the e-link to be used for other purposes other than touch keys.

### View Menu Functions

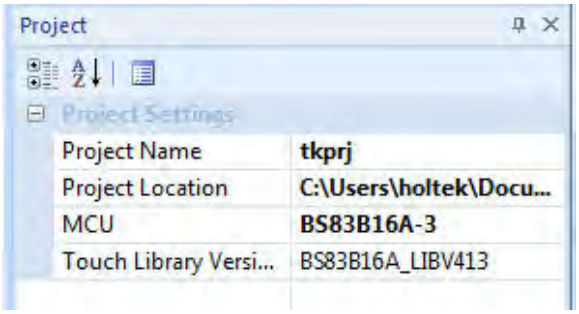
In this menu various information can be selected for display on the workshop working area. Functions such as Toolbox, Properties, Global Options, Project, MCU Resource, Output and Help, can be selected for display in the corresponding Window. In the Available Language section, select the appropriate language for workshop use from a choice of presently available, Traditional Chinese, Simplified Chinese and English.

## Toolbox Window

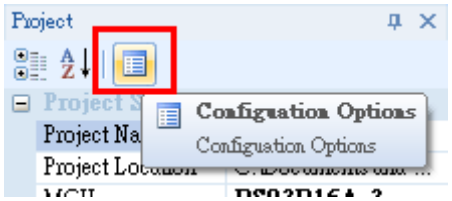
Here keys and components are provided for users to add functions.



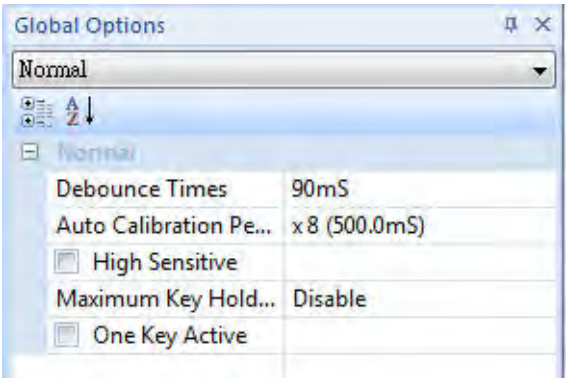

## Project Window




- Project Name: Enter the project name. Note that after a "Save" operation the project name can not be changed later.
- Project Location: Set the project path, the default path is the same as the HT-IDE3000.
- MCU: Choose the MCU that is to be used.
- Library Application: Choose the touch software library version.
- MCU Configuration Options: For normal users, the MCU options are not required to be setup so the default options can be used. Click the red framed block below to make changes if necessary.



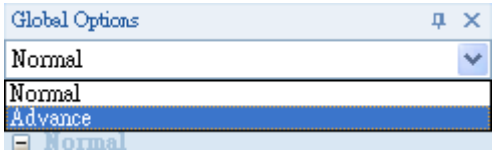
## Global Option Window




The global option window provides the touch key parameter for user setup. The available touch key parameters are shown in the accompanying table.

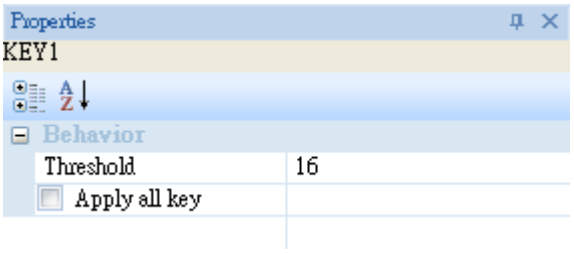
| Name | Range |
|---|---|
| Debounce Times | 50ms~190ms |
| Auto Calibration Period | 62.5ms~937.5ms |
| High Sensitive | 0=Normal Sensitive. 1=High Sensitive (check) |
| Maximum Key HoldTime | Disable. 4 sec~60 sec |
| One Key Active | 0=Off; 1=On (check) |
| Fast Response[1] | 0=Off; 1=On (check) |
| Auto Frequency Hopping[1] | 0=Off; 1=On (check) |
| Power Save[1] | 0=Off; 1=On (check) |
| Noise Protect[1] | 0=Off; 1=On (check) |
| Moving Calibration[1] | 0=Off; 1=On (check) |

Note: 1. Here it is necessary to check Advance Mode.
2. Options will vary according to the library version.



## Properties Window

When dragging a component, its properties can be set in the properties window or by clicking on the added component to change its properties. If a component does not require additional settings, then the properties window will be blank. The key properties are setup as follows:




The Key trigger threshold value has a range of 8~255. Check "Apply all key" and adjust the threshold values of the other keys.

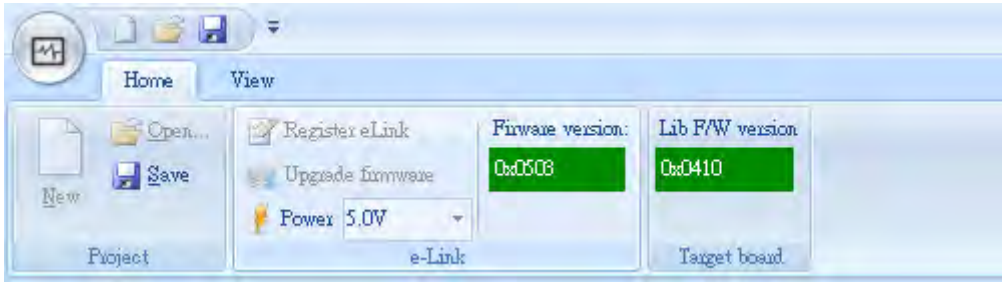
# 3 Touch Key Tuning S/W Functions and Operation

The Touch Key Tuning functions provide users with a software interface to observe the key signals as well as providing a platform for touch key sensitivity and parameter adjustment. The platform allows users to observe the results immediately after adjustment. In addition to being used via the Holtek Touch Key Workshop, the tuning software can also be used independently.

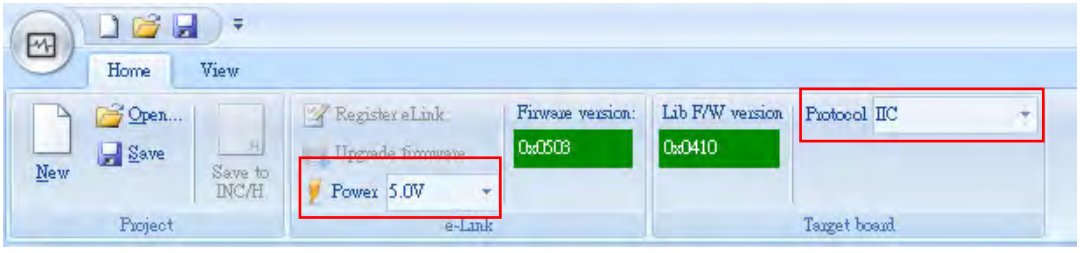
## Quick Start

### Touch Key Tuning

1. After running from within the Touch Key Workshop the tuning software menu screen is shown as follows:




2. After executing the tuning software, the following screenshot will be displayed. It is necessary to select the target board and e-IsoLink transmission protocol first, which is set in the "Protocol" section of the software with a default protocol of IIC. After this the power supply for the target board can be setup.



## S/W Functional Description

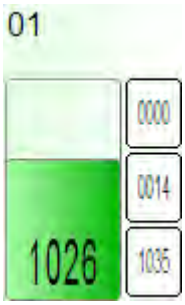
1. Touch Key signal observation area
2. Tuning Window
3. Global Option Window
4. Scope Window

## Touch Key Signal Observation Area

From the touch key signal observation area, whether the pin is defined as a touch key or I/O pin, it can be observed within this area. If the pin is used as an I/O pin, then it will be grayed out as shown below. If the pin is used as a touch key then users can click on the key to observe it in more detail.

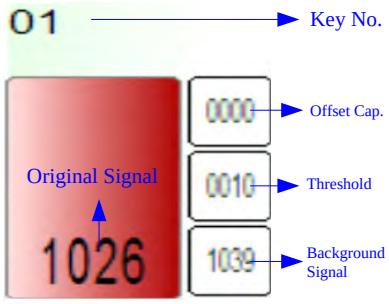
### Key State Display

The actual detected difference is shown in the green block, the greater the difference is, the more the green area is.



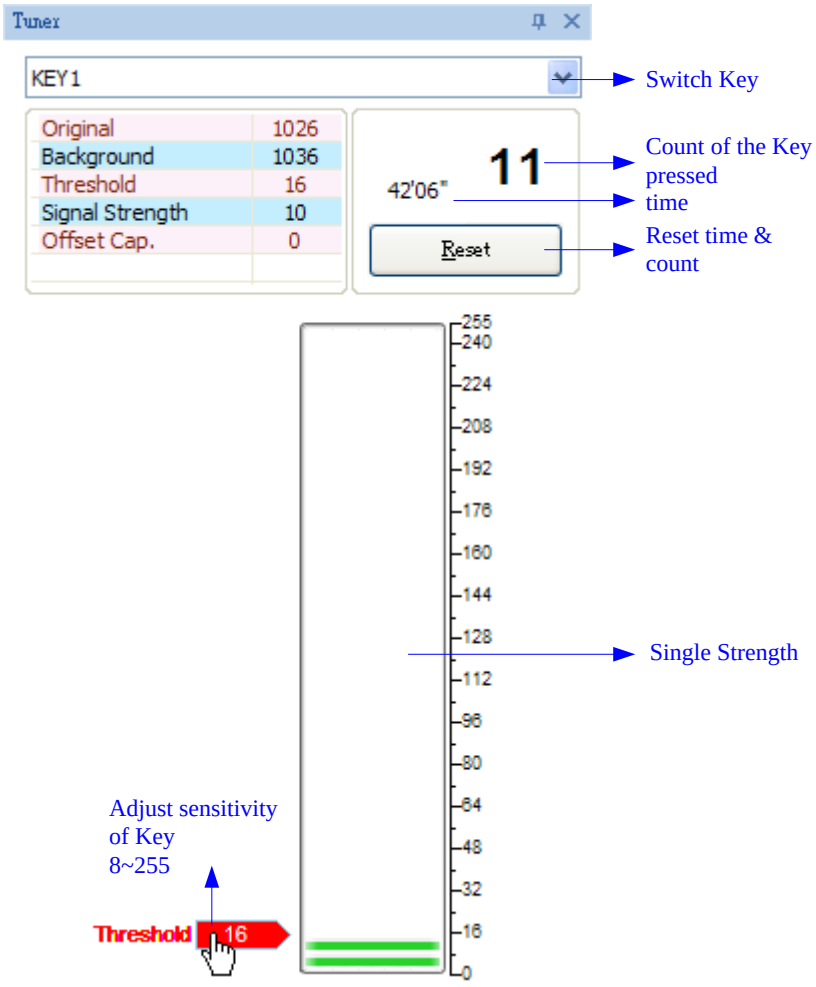

When the key is pressed, it will be displayed in red, as shown in the diagram, here KEY1 is pressed and the key flag is setup in the program.

The displayed numbers in the key icon are described in the following diagram.




## Tuning Window

The Tuning Window can observe a single key signal value and adjust the key sensitivity.

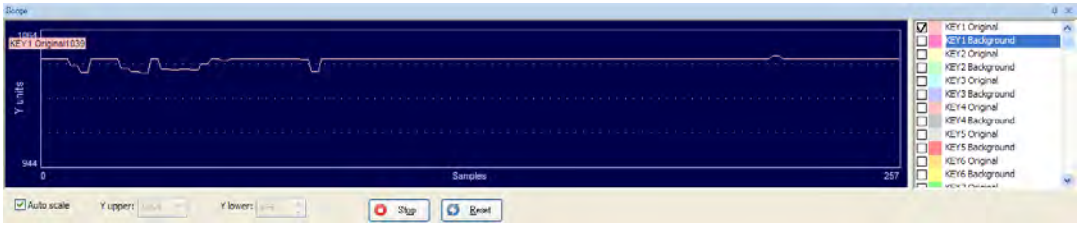


## Global Option Window

The Global Option Window provides touch key parameters which the user can change. Users can observe the adjusted results immediately after the setup values are changed. Refer to Page 16, Global Option Window, for the touch key parameters.

## Scope Window

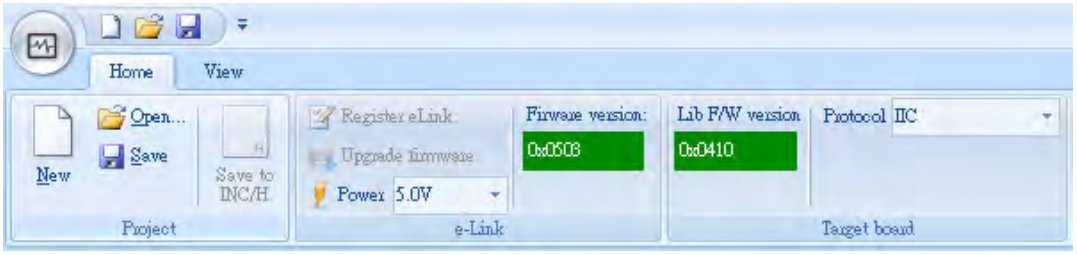
The Scope can display the key values. Users can check the list on right side of the Scope window to observe the corresponding selected key waveforms.




### Functional Description

- Automatic Scale: If checked, the software will automatically setup the Y-axis display range, otherwise the Y upper and lower limits will need to be setup manually.
- Start/Stop: Start or stop the Scope display.
- Reset: Clear the waveform and reset the pressed key count value and time in the tuning window.

## Menu Functional Description



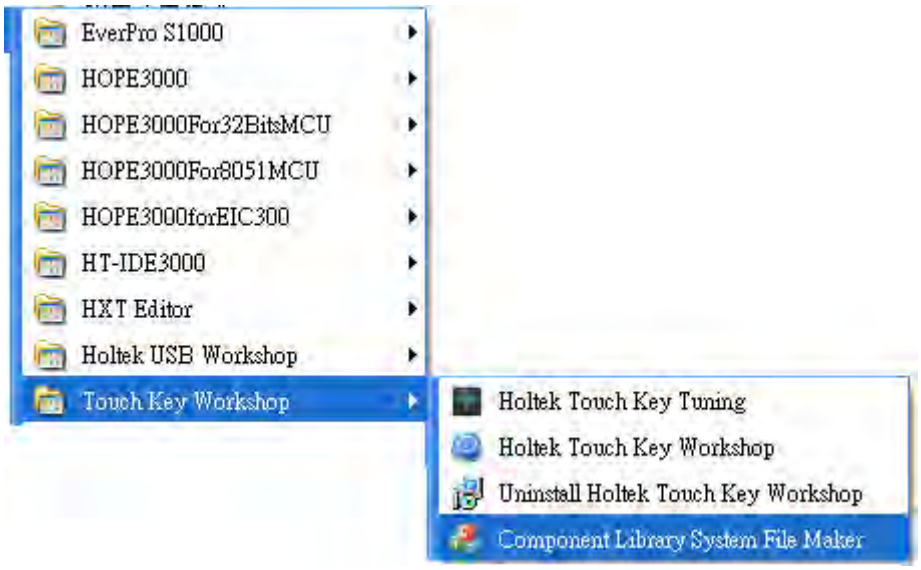

- New: Create a new Touch Key Workshop project
- Open: Open a previously saved Touch Key Workshop project file
- Save to INC/H: Touch Key setting output saved to HXT_REFERENCE.inc
- Register e-Link: The e-Link must be registered before use. If this area is highlighted, then the e-Link has already been registered.
- Upgrade firmware: Upgrade the e-IsoLink firmware, or change the usage for non- Touch Key e-Link use.
- Power: Set the e-IsoLink to provide power to the target board. There are 5V, 3.3V or external power supply options.
- Protocol: Select the communication protocol between the target board and the e-IsoLink. There are two kinds of interface, IIC and UART. If the "TUNING_IIC" in the Touch Key Workshop is selected, then the IIC protocol will be used. If "TUNING_UART" is selected, then the UART protocol will be used.

# 4 Component Generation

Touch Key Workshop is an open platform, in which advanced users can create their own component library, which can be shared with other users.

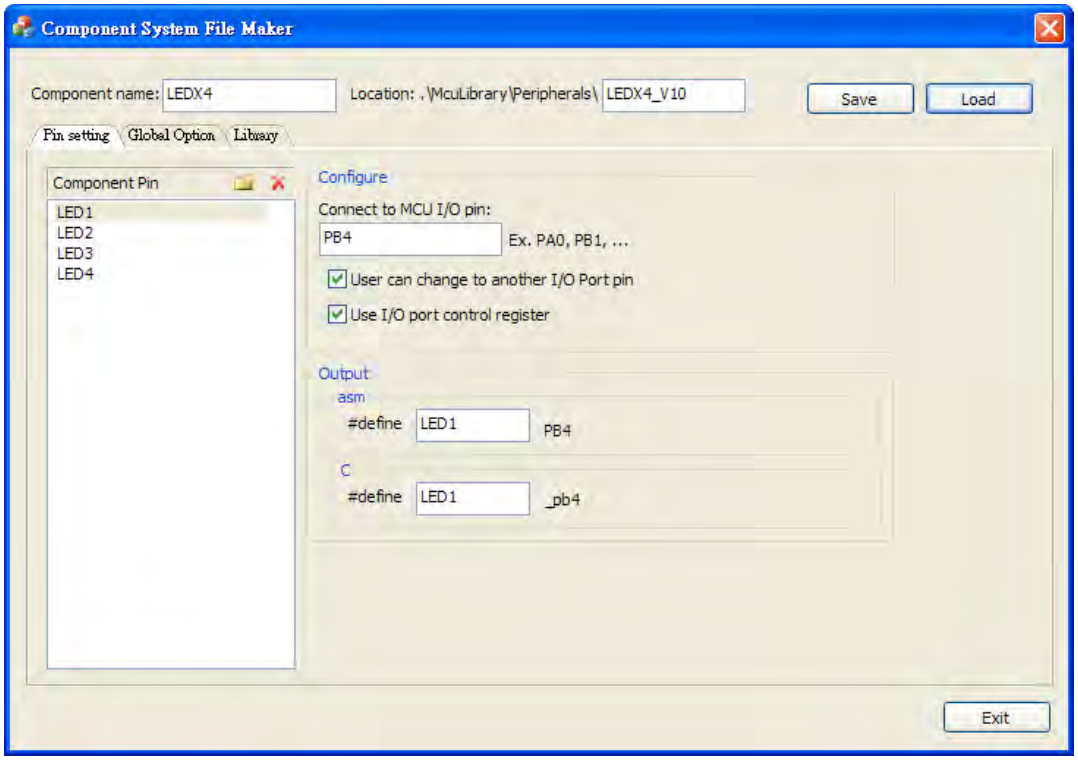
## Component Library System File Maker

Users can execute the "Component Library System File Maker" in the start menu to call up this creation function.



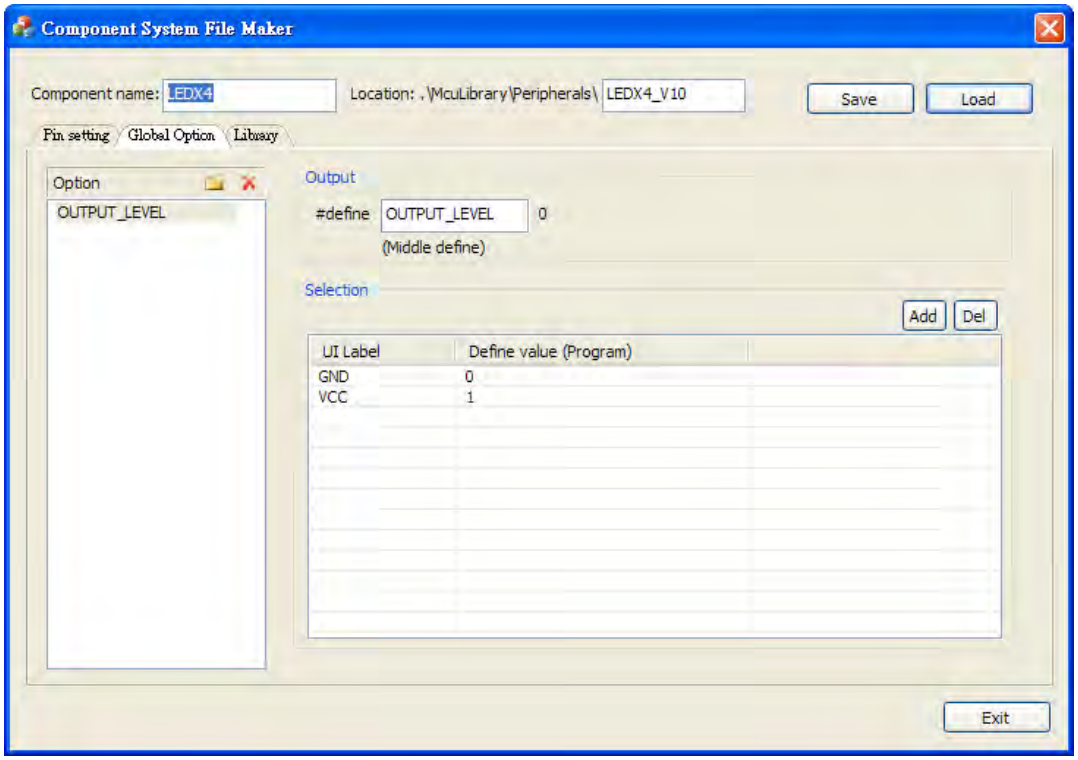
## Maker instructions

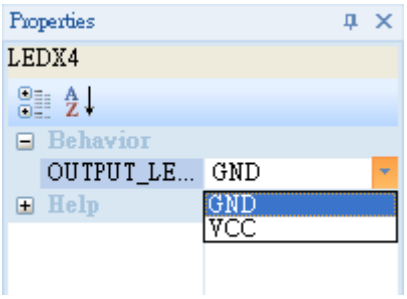
- **Step 1 – Pin setting**




1. Specify the component name, and it will appear in the toolbox of the Touch Key Workshop.
2. Specify the folder name for the component library path. The folder is required for proper placement of the component system files, the related program code files and the component help documents. Its root directory is the "McuLibrary\Peripherals" directory under the platform installation path. As an example, if the platform installation path is "C:\Program Files\Holtek MCU Development Tools\Touch Key Workshop", then the folder should be located in "C:\Program Files\Holtek MCU Development Tools\Touch Key Workshop\McuLibrary\Peripherals".
3. "Component pin setup" will setup the component pins combined with the MCU I/O pins. These settings also affect the software display. If the component does not have a corresponding pin, then it is not necessary to implement this setup.
4. After setting the "Component pin setting", the right side can be clicked in sequence for the detailed settings.

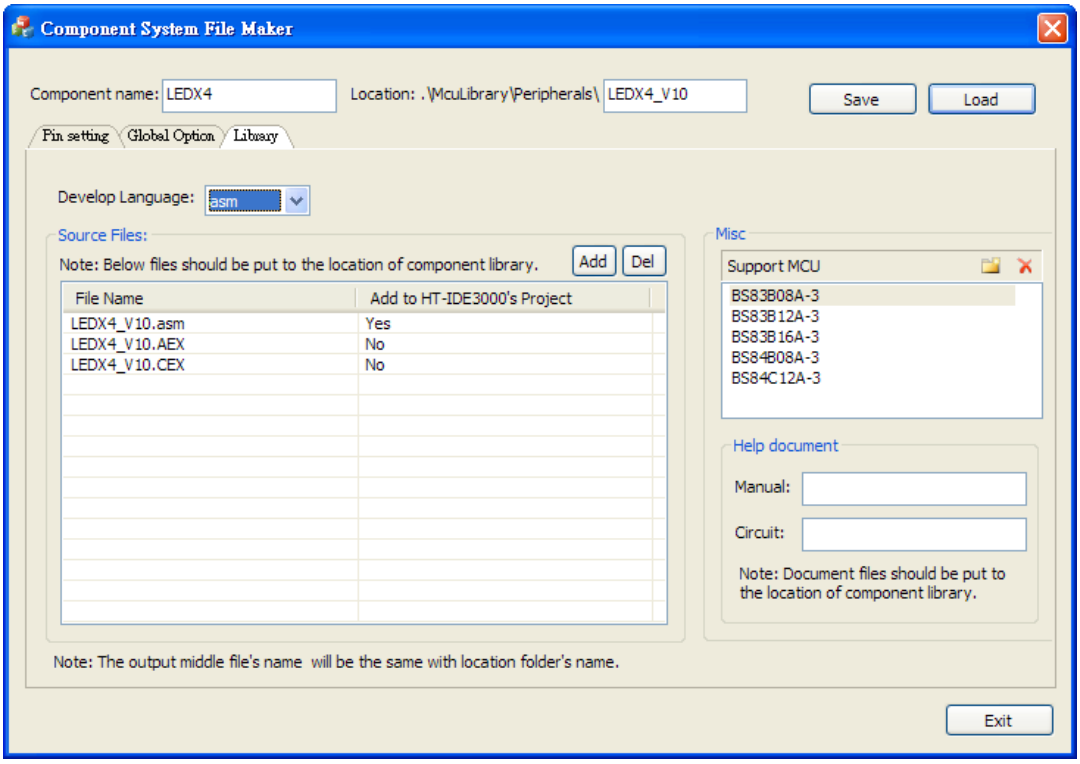
- **Step 2 – Global Option**



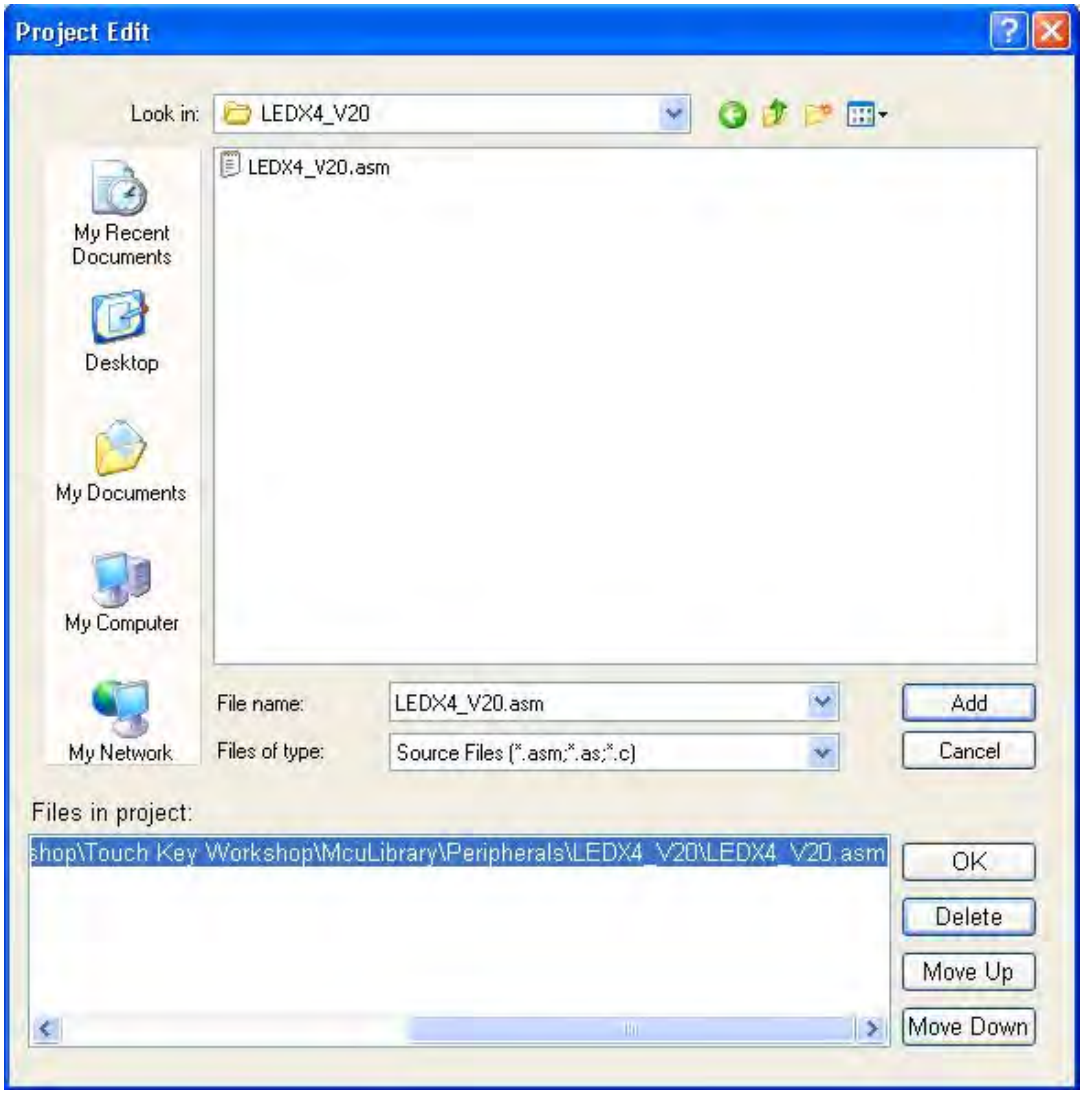




After setting, the software screen is shown in the accompanying diagram.

- **Step 3 – Library**




1. Select the development language: C language or assembly language. The C language compiler can only use the V2 version at the present time.
2. Set the component used code file in the source file. If "Yes" is selected to "Add to HT-IDE3000's Project", then the HT-IDE3000 will add the files to the project, as shown in the following figure.
3. If the source files' content is blank, when "Save" is first executed, it will generate .C/.ASM, .AEX and .CEX with the name of the component directory automatically. For example, the component directory sets "LEDX4_V10" and the development language selects "asm", then it will generate "LEDX4_V10.asm", "LEDX4_V10.AEX" and "LEDX4_V10.CEX" in the component directory.




1. The MCU name which supports the component should be setup in the "Misc" area.
2. The component description files can be setup in the "Help Document" area. With regard to documents, it is recommended that PDF files are used and that they should be placed in the component library location.

## Component programming

- Program structure: users need to implement two subroutines named using the component names.
  - <component name>_INITIAL: For the component initialization at power on.
    e.g. LEDX4_V20_INITIAL
  - <component name>: Component functional program entry
    e.g. LEDX4_V20
- File naming rule: The files need to be named the same as the folder.
- File structure: It is necessary to provide at least three kinds of files with extension names as follows:
  - .C/.ASM: Place the main program for the component. If the development language is the C language, then the extension name is .C. If the development language is assembly language, then the extension name is .ASM.
  - .AEX: Use assembly language syntax to locate the label of the external output.
    e.g.

```
EXTERN  _LEDX4_V20_INITIAL:NEAR
EXTERN  _LEDX4_V20:NEAR
```

  - .CEX: Use C language syntax to locate the function name of the external output.
    e.g.

```
extern  void    LEDX4_V20_INITIAL();
extern  void    LEDX4_V20();
```

# 5 Appendix A

The e-IsoLink F/W will automatically identify the MCU type used for evaluation and define the e-IsoLink pin. Two examples follow:

(A)

| Pin | I²C | ICP | OCDS |
|---|---|---|---|
| 1 | — | — | — |
| 2 | SDA | — | — |
| 3 | — | — | — |
| 4 | SCL | — | — |
| 5 | — | ICPDA | O2D |
| 6 | — | ICPCK | O2C |
| 7 | — | — | — |
| 8 | VDD | VDD | VDD |
| 9 | — | — | — |
| 10 | GND | GND | GND |

(B)

| Pin | I²C | ICP |
|---|---|---|
| 1 | — | — |
| 2 | SDA | ICPDA |
| 3 | — | — |
| 4 | SCL | ICPCK |
| 5 | — | — |
| 6 | — | RESB |
| 7 | — | — |
| 8 | VDD | VDD |
| 9 | — | — |
| 10 | GND | GND |

The MCU pin usage is as follows:

| MCU | Class |
|---|---|
| BS82B16-3 | (A) |
| BS83A04A-3 | (A) |
| BS83A04A-4 | (A) |
| BS83B12-3 | (B) |
| BS83B12A-3 | (A) |
| BS83B12A-4 | (A) |
| BS83B16-3 | (B) |
| BS83B16A-3 | (A) |
| BS83B16A-4 | (A) |
| BS83C24-3 | (B) |
| BS84B08A-3 | (A) |
| BS84C12A-3 | (A) |

# 6 Appendix B

Evaluation back board cautions:

If evaluation back board is connected with a battery, the power cannot be turned on during or before downloading, otherwise it will affect programming. If there is no any operation for about 2 minutes after the power is turned on, the power will be automatically turned off.

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